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Information Thermodynamics applied to the MERA quantum circuit.[1] VASILIOS PASSIAS, VICTOR CHUA, APOORV TIWARI, SHINSEI RYU, University of Illinois at Urbana-Champaign — We interpret the MERA (Multi-scale Entanglement Renormalization Ansatz) tensor network as a unitary quantum circuit to study excited states of quantum spin-chains. Contrary to the common use of MERA as a variational ground state ansatz, the quantum circuit defined by MERA – adapted to a fixed ground state – is employed as a diagnostic tool to study dynamically evolving excited state wavefunctions. Outputs of the quantum computation emanating from the isometry tensors, which are normally approximate tensor product states, now fluctuate strongly. These "bulk" degrees of freedom in the MERA which act as logical qubits are studied using tools from quantum information theory and information thermodynamics. A local temperature scale based on Landauer's information erasure principle is defined to measure their degree of fluctuation. We investigate properties of this temperature against the expectations of Luttinger's theorem which relates weak field gravity to heat flow.

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